

Iconic S.F. Parkway Features Innovative Design That No One Will See

Sustainability was the byword for the Presidio Parkway project from conception to completion, defining everything from the native plants above its tunnels to the innovative drainage system below.

That drainage system was no small matter. This new parkway at the southern end of the Golden Gate Bridge in San Francisco produced 8 percent more runoff than the old route, which was already straining the existing drainage system.

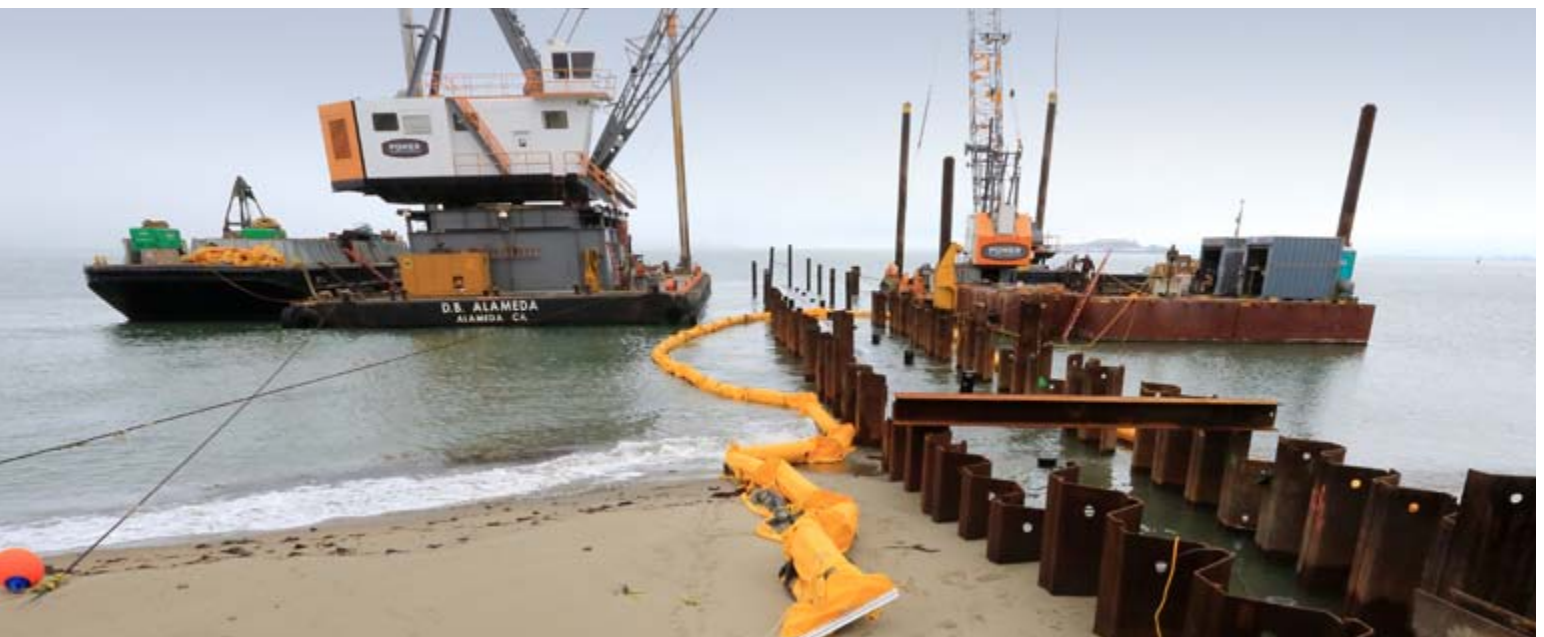
One drain, running from Mason Street to the bay, was a particular problem. Originally, a set of four drains – alphabetically listed as I, J, K and L – were merged into a single drain in the late 1990s. But continuous tidal action eventually buried the pipe outlet under 6 feet of beach sand and with every storm, San Francisco Public Works would have to excavate the pipe outlet and create a drainage trench into San Francisco Bay. Tidal action, however, would fill the trench

within hours and the outlet would clog, leading to flooding along Mason Street and Crissy Field, a recreational area along the San Francisco Bay waterfront.

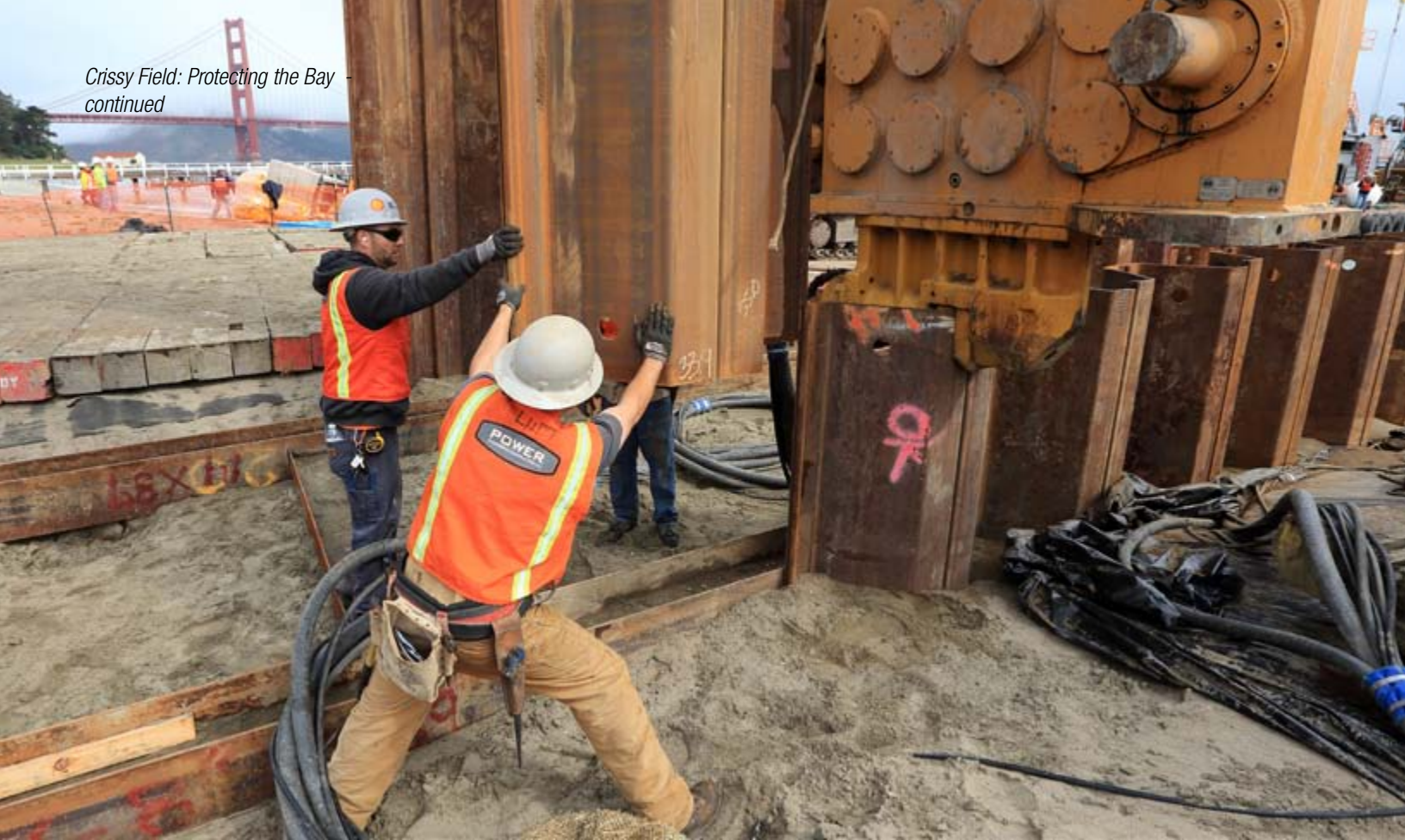


Enlarging and extending the so-called “IJKL” drain into the San Francisco Bay beyond Crissy Field Beach was more than an engineering challenge. Crissy Field is a popular tourist location and home to several protected plant and animal species. Moving forward required approval from a range of stakeholders and regulatory agencies. Among them: Presidio Trust, the National Park Service, the U.S. Coast Guard, the San Francisco County Transportation Authority, the Regional Water Quality Control Board, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service and the Bay Conservation and Development Commission.

Caltrans designers settled on a 54-inch, high-density polyethylene pipe, which would be buried deeper than the original to obscure the pipe even at low tide. The pipe would rest on piles of recycled plastic that would resist corrosion, protect water quality and last a long time.



The yellow, plastic “Ruffwater” turbidity curtain was custom-designed for the parkway drainage contract. It prevented fine sediment raised during excavation from spreading in the bay.



Workers maneuver the pile driver as they install vertical sheet piles in the sand, creating an open trench to place the 54-inch pipe.

Meeting Environmental Challenges

After the design was complete, the project team faced new challenges when the scheduled opening was moved from 2016 to 2015.

“Our main challenge was to get all of the environmental permits and clearances one year ahead of the original schedule,” said Co-Project Manager Joon Kang.

They obtained the permits, which came with a list of restrictions to ensure the project made the least possible impact on its environment. One of the permit conditions was protection of the western snowy plover, a small bird local to the Crissy Field area.

“The western snowy plover is an endangered species due to its habitat loss resulting from human disturbance,” said District 4 Biologist Ryan Graybehl. “The plover has come to the point where there is not enough population to sustain itself.”

To avoid disturbing the species, Caltrans had to limit the work window to eight weeks between May and July 2015. Native vegetation was carefully moved and later replanted, biological monitors were installed on both dry ground and in the bay. Timber mats helped prevent damage to the sand dunes. The pipe sections themselves were fused at a workshop on the other side of the bay, then floated to the site via two tugboats.

One of the tougher problems resulted in an innovative solution that could have long-lasting dividends. Excavating loose, sandy soil causes “turbidity,” the muddying of the waters. Normally, the problem is solved by installing cofferdams. But traditional cofferdams require a long construction time, which wasn’t possible on this project. Caltrans engineers considered a “turbidity curtain,” but the available models could not handle the high wind and wave velocities of the Crissy Field area.

Caltrans turned to a manufacturer, Elastec Inc., which designed a turbidity curtain specifically for this project that could handle the high winds and waves – the “Ruffwater” curtain. Once installed, both the contractor and Caltrans took water samples upstream and downstream every two hours. Not once did the water reach the threshold limits.

While the overall Presidio Parkway project was required to provide a permanent treatment system for runoff, the Crissy Field project was tasked simply with providing sufficient drainage. Eventually, onsite treatment will rely in large part on bioswales – landscape elements often filled with vegetation, compost and rocks – to filter the water before it goes into the bay.

Noise Reduction

When construction began, Caltrans' biggest concern was the pile-driving noise. If it were too loud, the local wildlife could be harmed and the pile driving would have to be halted – which would not work with an already short work window.

So, instead of normal pile materials – wood, steel, or concrete – the team used piles made of recycled plastic reinforced with fiberglass, known as Seapile. The combination of recycled plastic and fiberglass significantly dampened the noise. Not only that, it was far less corrosive than steel, and therefore better for the environment. Caltrans engineers combined the new plastic/fiberglass piles with a bubble curtain – the same technique used on last year's implosion of an old Bay Bridge pier. The combination worked extremely well. The only time the work had to be halted was when some curious seals ventured a little too close to the work site.



The air bubble curtain was operational during all pile-driving activities to ensure maximum sound level reduction. State Project Engineer Peter Aguilera estimates it achieved a 10 percent reduction in sounds levels.



The casing for the hydraulic impact hammer was placed around the support pile.

With the piles driven into place, Caltrans and the contractor headed into the home stretch. Tugboats floated the 453-foot-long fused sections of drain pipe from the other side of the Bay to Crissy Field Beach. Divers wrangled the pipe into place and secured it to the piles. After that, the cleanup and demobilization got underway.

The seals were not the only species to visit the construction site. Over the course of the project, the team counted 32 California sea lions, 27 Pacific harbor seals, three porpoises, seven humpback whales and a dolphin. Fortunately, the one species that caused the most worry, the endangered western snowy plover, was nowhere to be seen. But on the last day of the project, one of the marine biologists spotted a visitor that might have given pause to the dive teams – a thresher shark.

Despite the visitors, the project ended ahead of schedule and under budget. "It took a lot of teamwork and effort to design and deliver this unique and challenging project," said Caltrans District 4 Director Bijan Sartipi.

When the first of the El Niño rainstorms arrived in December 2015, the new drains worked flawlessly. The Crissy Field area is now free of chronic flooding, and the local wildlife thrives, as if no construction had ever taken place.

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